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# PATENT SPECIFICATION



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## COMPLETE SPECIFICATION

### Process for the Treatment of Liquid or Semi-solid Foodstuffs for Preserving them

I, HAROLD EDWIN POTTS, Chartered Patent Agent, of 12, Church Street, Liverpool, in the County of Lancaster, Subject of the King of Great Britain, do hereby declare the nature of this invention which has been communicated to me by Alfred Tietz and Fritz Unterberg, both of 21, Oosteinde, Amsterdam, Holland, both of German Nationality, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to the treatment of liquid and semi-solid foodstuffs with the object of preserving them for a long period of time. The invention relates more especially to the preservation of dairy products, such as milk, fresh or condensed, cream, skim milk, butter and the like. Other products including meat broth, oil emulsions, mayonnaises, meat and cheese pastes may with advantage be treated also in accordance with this invention.

In the specification of British Patent No. 420,985 it has been proposed to preserve, or keep fresh, liquid dairy products by freeing them from gases, dissolved therein, at a low temperature, about 10° C., adding oxygen under a pressure, e.g. of 8—10 atmospheres, and maintaining this oxygen pressure during storage, the substances so treated being then stored at temperatures below about 12° C. if they were to be preserved for a long time. One object of the present invention is to avoid the production and maintenance of a low temperature which entails expense and labour, more especially in summer and in hot climates.

It has now been found that a far-reaching destruction of the bacteria and a perfect preservation of the milk can be accomplished if the initial material, after having been freed from the gases dissolved therein and while in an atmosphere of undiluted oxygen, under pressure, is subjected to heat-treatment at a comparatively moderate temperature and then stored at ordinary temperature in oxygen under constant pressure. All attempts, hitherto made, to preserve milk or other liquid or semi-liquid foodstuffs for a longer period of time by heating in an oxygen atmosphere under

pressure, have been failures. If the foodstuffs could be preserved for days, their composition and taste were detrimentally affected by the high temperature to which they were exposed. Moreover the preserving effect exerted by the oxygen was paralyzed to a great extent by the presence of the gases dissolved in the material under treatment, whereby the oxygen was diluted and the conditions of life and development of the microorganisms present in the material upheld in a manner unfavourable to preservation.

The process according to this invention enables liquid and semi-liquid foodstuffs and more especially milk to be kept fresh and to preserve the character of a fresh material, for instance fresh raw milk, not only for a day or two but for a number of weeks, and this under all atmospheric conditions, also in summer and in tropical climates, without being required to resort to artificial cooling before or during storage. This is accomplished by a combination of steps, which were suggested separately, but were never before combined in the manner according to this invention and which, in their totality, lead to full success.

According to this invention the material to be treated, such as for instance raw milk, is freed from the gases dissolved therein (in the case of milk from the carbon dioxide, nitrogen, hydrogen sulphide etc.). The expulsion of these gases is advantageously effected by means of undiluted oxygen forced from below through the milk or other material, the oxygen thus displacing the other gases and mixing intimately with the milk or other material, which is thus saturated to a high degree with oxygen. The material under treatment is next heated to a temperature at which no material changes of the physico-chemical properties and of the taste occur and preferably to a temperature from 50° C. up to 65° or even 80° C. in an atmosphere of undiluted oxygen under pressure, the pressure not exceeding twenty atmospheres, preferably 8—12 atmospheres. Heating under these conditions is continued for some hours, whereafter the material under treatment is allowed to cool down or is

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cooled artificially, while keeping up sufficient pressure in the oxygen atmosphere above the material to avoid any material change in the degree of saturation of the material with oxygen. For it is imperative that up to the moment, when the material shall be consumed, all its particles shall remain in intimate contact with undiluted oxygen. Storage then occurs in presence 10 of oxygen under pressure.

More especially with regard to the preservation of milk this combination of steps according to our new process has been found to constitute a perfect solution of the problem. If milk is heated to 50—55° C. in an oxygen atmosphere under a pressure of about 10 atm., the degree of destruction of the microorganisms far exceeds that attained according to prior processes 15 of pasteurization or sterilization at much higher temperatures. All bacteria which do not form spores, and part of the spores themselves are killed. The surviving spores are no longer able to develop in an atmosphere of oxygen under high pressure. The action exerted by the new process 20 on the bacteria and spores is equivalent to heating to 100° C. for several minutes, without however being accompanied by changes of the chemical and physical 25 composition, i.e. the "raw" character of the material both as to composition and taste, is not materially altered. All pathogenic microorganisms present in the material are completely destroyed. The removal of the gases originally dissolved in the milk or other material even leads to an 30 improvement in taste. Our new process, being merely based on an intimate contacting, first at a temperature not exceeding 35 80° C. and thereafter at ordinary temperature, of the material with oxygen, undiluted by other gases and accumulated by pressure in and above the material in a 40 quantity sufficing for preservation during a 45 number of weeks, by dispensing with artificial cooling, entails but little expense.

Further researches have shown that under oxygen pressure the effect of the 50 heat on the microorganisms depends to a certain extent on the nutriment content of the starting material, and that it is advisable, when the nutriment concentration is high, to employ a greater oxygen 55 pressure, and/or higher temperatures, and/or longer periods of treatment, than with initial materials poorer in nutriment.

A special advantage of the process according to the invention for example for dairy products is that it is a valuable substitute for the pasteurizing otherwise usual.

#### EXAMPLE 1.

50 kgs. meat broth are introduced into a 60 pressure container, and the gases present

in the broth are forced out by introducing oxygen. The oxygen pressure is then increased to about 10 atm., and the broth heated at this pressure up to about 50° C. for 4—8 hours. The container with its 70 contents is then allowed to cool down while maintaining the oxygen pressure of 10 atm., and can now be stored for a long time at ordinary temperature.

#### EXAMPLE 2.

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100 kgs. whole milk, which are heated to 58—60° C., are filled into a pressure vessel. Oxygen is then passed into the milk from below to remove any gases present. After passing oxygen through 80 for a short time an oxygen pressure of about 10 atm., is established. The vessel is heated to 58—60° C. from 4 to 8 hours. Thereafter, while maintaining an oxygen pressure of about 8—12 atm., it is cooled 85 down in a suitable way. The milk in the vessel is practically stable for weeks. It offers the advantage, as compared with pasteurized or sterilized milk, of altogether lacking the boiling flavour, and the natural 90 albuminous substances are not detrimentally affected so that its nutritive value and its digestibility are practically unaltered.

#### EXAMPLE 3.

25 kgs. evaporated or condensed milk 95 having a content of 18% fatty dry substance are filled into a pressure container at 65° C. and, as in Example 1 or 2, are freed from the dissolved gases by bubbling oxygen through the liquid. An oxygen 100 pressure of about 10 atm. is then set up in the container and the container heated for 4—8 hours to 65° C. Finally, the contents of the container are allowed to cool down, or are cooled with the aid of a cooling 105 medium, while maintaining an oxygen pressure of 10 atm. The container can be stored at ordinary temperature, for instance 20—35° C., and keeps its contents 110 fresh for weeks.

It is preferable to carry out the heat-treatment at 50 to 60° C. for 4 to 8 hours with an oxygen pressure of 10—12 atmospheres. Oxygen in the usual commercial form may be employed.

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Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, which has been communicated to me by my foreign correspondents, I declare 120 what I claim is:—

1. The process of preserving liquid or semi-liquid foodstuffs and more especially dairy products, characterised by the combination of the steps of freeing the material 125 under treatment from the gases dissolved therein, enclosing the material in an atmosphere of undiluted oxygen under pressure, the pressure not exceeding 20 and preferably being about 8 to 12 atmospheres, 130

heating the material in this atmosphere to a temperature at which no material changes of the chemico-physical properties and of the taste occur, allowing it to cool down, 5 while keeping it in the atmosphere of oxygen under pressure and storing it in the same atmosphere.

2. The process of claim 1, further characterised in that milk is heated to a 10 temperature of 50°—65°C., for about four to eight hours.

3. The process of claim 1, further characterised in that the material is freed 15 from gases by forcing undiluted oxygen through it.

4. The process of claim 1, further characterised in that the temperature and/ or the pressure and/or the heating period

are adapted to the nutriment content of the material under treatment in that at a 20 high nutriment content a higher temperature and/or pressure and/or a longer heating period are employed than with a material of lower nutriment content.

5. The process of preserving liquid or 25 semi-liquid foodstuffs substantially as described.

6. Foodstuffs and more especially dairy 30 products whenever treated for their preservation by heat and oxygen under pressure, by the process hereinbefore particularly described and ascertained.

Dated this 31st day of August, 1936.

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